REMARKS

By this amendment, claims 1 and 4-22 are pending in the application, of which claims 1, 8 and 16 are being amended, and claims 21 and 22 are being added. The amendments are fully supported by the originally filed Specification and original claims and add no new matter. For example, the claim language "stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for 5 seconds" is supported at paragraph 0033. Entry of the amendments and reconsideration of the present case is respectfully requested.

Rejections under 35 U.S.C. 102 (e)

Claims 1 and 4-20 were rejected under 35 USC 102 (e) as being anticipated by Somekh (US patent 6,394,109).

Somekh does not teach claim 1 which recites, inter alia, a method for cleaning an electron beam treatment apparatus that includes generating an electron beam that energizes a cleaning gas in a chamber of the electron beam treatment apparatus, monitoring an electron beam current, adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value, and stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time.

The Examiner suggests that Somekh discloses the claimed process step of "stopping when the cleaning gas pressure becomes substantially constant for a predetermined length of time" at column 5, line 66 to column 6, line 30 and FIG. 4. However, Applicant submits that this is an incorrect reading of Somekh. At this section, Somekh teaches:

> "In one embodiment of the present invention, oxidizer is introduced at specified flow rates until particular partial pressures within the illumination chamber 204

and process chamber 220 are reached. ... The flow control unit 219 controls the flow of oxidizer into the imaging chamber. The flow control unit 219 allows a user to independently specify and monitor the flow of oxidizer to the illumination chamber 204 and process chamber 220, on a precise basis. The actual oxidizer flow rates and pressures that are maintained depends on several factors.... For a sub-atmospheric lithography system, oxidizer is introduced at a rate and pressure that maintains the sub-atmospheric environment within the imaging chamber."

Thus, Somekh teaches introducing oxidizer is at a specified flow rate to reach a constant partial pressure. By teaching that a constant pressure of a gas is achieved by providing gas at a specified flow rate, Somekh teaches away from the claimed process step of adjusting the pressure of the cleaning gas to maintain the electron beam current at a substantially constant value during the cleaning process. In the present cleaning process it was found that the electron beam current varies during the process as cleaning residues are vaporized. Thus, claim 1 is to a process in which the gas pressure is adjusted during the cleaning process to achieve a steady electron beam current value which would otherwise keeps changing. The process step of adjusting the gas pressure during the process is the opposite of the process taught by Somekh which provides a gas flow rate that automatically maintains the gas pressure constant.

Second, the claimed process includes the step of stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time. Somekh teaches the opposite step of maintaining a constant partial pressure of gas by flowing gas into the chamber at a specified flow rate. Applicant is claiming stopping the cleaning gas flow when the cleaning gas pressure becomes constant; and if this step were applied to Somekh, the Somekh process would be stopped before it is finished since Somekh teaches that a constant pressure is needed during the cleaning process. As explained in the Specification, and demonstrated, for example in FIG. 3, in the present process, the cleaning gas pressure is purposefully changed during the process to maintain a particular electron beam current. However, as the residues are cleaned off, the cleaning gas pressure

automatically starts leveling off until it reaches a substantially constant level. At this point, Applicant has discovered that the cleaning process is completed so the flow of cleaning gas is stopped. This is opposite to the teaches of Somekh that suggest flowing the cleaning gas to maintain the partial pressure of the oxidizer gas constant during the gas cleaning process, instead of stopping the flow of cleaning gas when the gas pressure becomes constant.

Thus, Somekh teaches against adjusting gas pressure as claimed in claim 1, and further teaches that a constant partial pressure of gas is achieved by flowing a particular gas flow rate into the chamber during the cleaning process – not that the cleaning gas flow should be stopped when a substantially constant gas pressure is reached. Consequently, Somekh does not teach each and every element of claim 1, and thus, does not anticipate claim 1 or the claims dependent therefrom under section 102(e).

Similarly, Somekh does not teach claim 8, which also recites generating an electron beam that energizes a cleaning gas in an electron beam chamber, and stopping the flow of cleaning gas after the cleaning gas pressure becomes substantially constant for a predetermined length of time. Somekh does not disclose that the cleaning process should be stopped when the gas pressure becomes substantially constant, or the benefits of stopping the cleaning process when a constant pressure is reached. In fact, Somekh that teaches the opposite by teaching flowing oxidizer gas to maintain the partial pressure of the oxidizer gas constant during the gas cleaning process, instead of stopping the cleaning process when the gas pressure becomes constant. Thus, Somekh does not anticipate claim 8 under section 102(e).

Furthermore, Somekh does not teach added claim 16, which is to a method of cleaning a chamber of an electron beam treatment apparatus in which a cleaning gas is introduced into the chamber, and an electron beam is generated to energize the cleaning gas in the chamber. An electron beam current is set in the chamber of about 10 mA or above. The pressure of the cleaning gas is adjusted to

maintain the electron beam current at a substantially constant value. An endpoint of the cleaning process is determined and introduction of the cleaning gas is stopped when the cleaning gas pressure reaches a substantially constant value.

Somekh teaches introducing oxidizer gas is at specified flow rates to reach a constant partial pressure. Somekh teaches against the claimed process step of adjusting the pressure of the cleaning gas by teaching that a constant partial pressure of a gas is desirable. Further, Somekh does not teach stopping the cleaning gas flow when the cleaning gas pressure becomes constant. Instead, Somekh teaches the opposite by teaching that the partial pressure of the oxidizer gas should be held constant during the gas cleaning process, instead of stopping the cleaning process when the gas pressure becomes constant. Because Somekh teaches against adjusting gas pressure, and further teaches that the partial pressure of oxidizer should be constant during the cleaning process, Somekh does not anticipate claim 16 or the claims dependent therefrom.

Rejections under 35 U.S.C. 102 (b)

Claims 1 and 4-20 were rejected under 35 USC 102 (b) as being anticipated by Ohtoshi et al. (5,539,211).

Ohtoshi et al. does not disclose each and every element of claim 1, because Ohtoshi et al. does not disclose, "adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value, and stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time."

The Examiner states that Ohtoshi et al. discloses "wherein the predetermined condition is that the cleaning gas pressure becomes substantially constant for predetermined length of time" at col. 11 lines 50 to col. 12, line 9.

However, at col. 11 lines 50 to col. 12, line 9, Ohtoshi et al. discusses the electron beam exposure apparatus of FIG. 2 and discloses that "...the inside of the column 1 being kept depressurized at a pressure of 10^{-7} Torr, plasma (active species) of 10^{-2} to several 10 Torr can be made flow, so that a time for recovering the depressurized pressure after cleaning can be greatly shortened." The plasma species are formed in a plasma generation portion 2 which is separate from and outside the column 1.

Ohtoshi et al. discloses that maintaining a low pressure of 10^{-7} Torr in the column 1 is desirable because it allows plasma species formed at a higher pressure of 10^{-2} to several 10 Torr in the plasma generating portion 2 to flow into the lower pressure column 1. Ohtoshi et al. also discloses cleaning the inside of the electron beam apparatus with the plasma.

However, Ohtoshi et al. does not teach the claimed process steps of adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value, or stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time, as claimed in claim 1.

Setting a constant low pressure of 10^{-7} Torr in the column 1 to "suck" in plasma species formed at a higher pressure of 10^{-2} to several 10 Torr outside the column is not the same process step as "adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value" as claimed. In fact, Ohtoshi et al. teaches against the claimed process step of adjusting the pressure of cleaning gas during the cleaning process by teaching that the pressure in the column should be held constant during the cleaning process, and not adjusted to different pressures.

Furthermore, Ohtoshi et al. does not teach the claimed process step of stopping the flow of cleaning gas when the cleaning gas pressure becomes

substantially constant for a predetermined length of time. In the teachings of Ohtoshi et al., if the cleaning process were stopped when the cleaning gas pressure becomes constant, as presently claimed, there would be no cleaning process because the Ohtoshi et al. teaches that the gas pressure is held constant from the very beginning of the cleaning process. Applicant is claiming stopping the cleaning gas flow when the cleaning gas pressure becomes constant. During the cleaning process, the pressure of cleaning gas is purposefully changed to maintain a particular electron beam current. However, when the residues are all cleaned off, the cleaning gas pressure automatically drops to a substantially constant level, and at this time, Applicant stops the flow of cleaning gas. This is opposite to the teachings of Ohtoshi et al. to maintain a constant pressure throughout the cleaning process. Thus, Ohtoshi et al. does not teach every element of claim 1, and consequently, Ohtoshi et al. does not anticipate claim 1 or the claims dependent therefrom, under section 102(b).

Similarly, Ohtoshi et al. does not teach claim 8, which also recites stopping the flow of cleaning gas upon reaching an endpoint after the cleaning gas pressure becomes substantially constant for a predetermined length of time. Ohtoshi et al. does not teach that the cleaning gas flow should be stopped when the gas pressure becomes substantially constant or the benefits of being able to determine when to stop the cleaning process. Thus, Ohtoshi et al. does not anticipate claim 8 or the claims dependent therefrom.

Ohtoshi et al. also does not teach claim 16, which recites, inter alia, adjusting the pressure of cleaning gas to maintain the electron beam current at a substantially constant value, and determining an endpoint of the cleaning process and stopping introduction of the cleaning gas when the cleaning gas pressure reaches a substantially constant value and maintains the value for 5 seconds. Instead, Ohtoshi et al. teaches maintaining a particular constant pressure during the cleaning process – not adjusting the pressure. In fact, Ohtoshi et al. teaches against the claimed process step of adjusting the pressure of the cleaning gas by teaching that a constant partial pressure of a gas is desirable. Further, Ohtoshi et al. does not teach stopping the

cleaning gas flow when the cleaning gas pressure becomes constant. Ohtoshi et al. teaches the opposite by teaching that the partial pressure of the oxidizer gas should be held constant during the gas cleaning process, instead of stopping the cleaning process when the gas pressure becomes constant. Thus, Ohtoshi et al. does not anticipate claim 16 or the claims dependent therefrom.

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,
JANAH & ASSOCIATES, P.C.

Date: November 9, 2005 By: _____

Ashok Janah
Reg. No. 37,487

AKJ/clh

Please direct all telephone calls to: Ashok K. Janah at (415) 538-1555.

Please continue to send correspondence to:

Patent Department, M/S 2061
APPLIED MATERIALS, INC.
P.O. Box 450A
Santa Clara, CA 95052.

S:\CLIENT\APPLIED\EBP\7034.p2\Amend.003.Advisory.doc